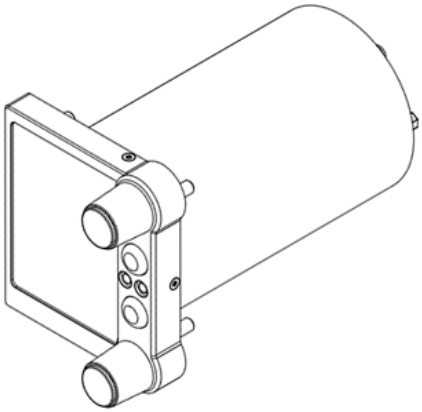

AIR Glide Display S

Pilot's Manual

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Notes

General Information

IMPORTANT!

Please read this manual carefully before installing or operating the device!

Pay attention to the restrictions on use!

This manual is an essential part of the device and must be kept in a safe place!

Document identification / revision status

This manual supports the following product types:

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Contents

1 General **1**
1.1 System Description . . . 1
1.2 Design Goals . . . 1

2 Safety, Liability and Support **3**
2.1 Safety instructions and restrictions on use . . . 3
2.2 Intellectual Property and Liability . . . 3
2.3 Support . . . 3
2.3.1 World . . . 3
2.3.2 Europe . . . 3

3 Operation And Controls **4**
3.1 User Interface Elements . . . 4
3.1.1 Rotary Knobs And Pushuttons . . . 4
3.1.2 Status-LED . . . 4
3.2 Switching AIR Glide ON and OFF . . . 4
3.2.1 Switching AIR Glide ON . . . 5
3.2.2 Switching AIR Glide OFF . . . 5
3.3 Display Pages . . . 6
3.3.1 Page Navigation Indicator . . . 6
3.4 Flight-Mode . . . 6
3.4.1 Sound-Scheme . . . 7
3.4.2 Behavior when changing flight-mode . . . 7
3.5 Menu-System . . . 8
3.5.1 Entering the Menu and Menu-Levels . . . 8
3.5.2 Types Of Menu Items . . . 8
3.5.3 Directly closing the Menu . . . 9
3.6 Text-Input . . . 10

4 Main Functions **11**
4.1 Variometer . . . 11
4.1.1 Variometer-Display-Page . . . 11
4.1.2 Vario Indicator And Pointers . . . 11
4.1.3 Vario indication On Other Display-Pages . . . 12
4.2 Speedcommand . . . 13
4.2.1 Speedcommand-display-page . . . 13
4.2.2 Speedcommand Behavior . . . 13
4.3 Traffic . . . 14
4.3.1 Traffic-Display-Page . . . 14
4.3.2 Status of connected collision warning units . . . 15
4.4 Navigation . . . 15
4.4.1 Navigation-display-page . . . 15
4.4.2 Target Selection In Navigation . . . 16

4.4.3 Nearest Function . . . 17
4.4.4 Direct-To Function . . . 17
4.5 Attitude and Heading Indicator . . . 18
4.6 Flight Logging . . . 20
4.6.1 Entering and declaring IGC Flight-Info and Tasks . . . 20
4.6.2 Entering IGC Flight-Info . . . 21
4.6.3 Declaring a Route/Flight-info . . . 21
4.6.4 Downloading Flights . . . 21
4.6.5 Flight Recorder Setup . . . 22
4.6.6 IGC-Pilot-Event . . . 22
4.7 Features that are not allowed in some competitions . . . 23
4.7.1 Possibly Unallowed Features . . . 23
4.8 Locking Unallowed Features / AHI Lock . . . 23
4.8.1 Required Firmware Versions . . . 23
4.8.2 Security . . . 24
4.8.3 Locking the AHI . . . 24
4.8.4 Activating an AHI locking timeframe . . . 24
4.8.5 Behavior when AHI lock is active . . . 25
4.8.6 Determining if lock is active . . . 25
4.9 Hardware and Data Monitoring . . . 25
4.9.1 Data Validity . . . 25
4.9.2 Powermanagement . . . 26

5 Audio-System 27
5.1 Setting up volume . . . 27
5.2 Audio-Menu . . . 27
5.3 Bass Boost Feature . . . 28
5.4 Vario/speedcommand Audio . . . 28
5.4.1 Sound-Scheme in Cruise-Mode . . . 28
5.4.2 Sound-Scheme in Climb-Mode . . . 28
5.5 Voice Output . . . 29
5.5.1 Message Priorities . . . 29
5.5.2 Messages . . . 29
5.5.3 Acknowledging Messages . . . 30
5.5.4 Repeating Messages . . . 30

6 Setup 31
6.1 Setup of Flight-Paramters in Flight. . . . 31
6.2 Filter- and Compensation-Values . . . 31
6.2.1 Filters and Recommended Values . . . 31
6.3 Magnetometer-Compensation . . . 32
6.3.1 Performing Magnetometer Compensation . . . 32
6.3.2 Quality indicator . . . 33
6.4 Individualization and Adaption . . . 33
6.4.1 Language . . . 33

6.4.2 Units . . . 33
6.4.3 Info-Boxes . . . 33
6.4.4 Other settings . . . 34
6.5 Factory Reset . . . 35

7 Maintenance and First Use 36
7.1 First Use . . . 36
7.1.1 Switching AIR Glide on the first time . . . 36
7.2 Required Settings . . . 36
7.2.1 Before first flight . . . 36
7.2.2 Special settings when installing multiple displays . . . 36
7.2.3 During first flight . . . 36
7.3 Softwareupdates . . . 37
7.3.1 Prepare an Update . . . 37
7.3.2 Updating your Device . . . 37
7.4 Data Synchronization . . . 38
7.4.1 Behavior . . . 38
7.4.2 File- and Datatypes . . . 38
7.4.3 Synchronization . . . 38
7.4.4 Navigation data . . . 39
7.4.5 Downloading recorded flights . . . 39

8 Calculations and Informations 40
8.1 AHRS . . . 40
8.2 Wind Calculation . . . 40
8.3 Speedcommand . . . 40
8.4 Vertical Air-Mass . . . 40
8.5 Final Glide Calculation . . . 42

1 General

1.1 System Description

AIR Glide Display S is a 57mm display unit with acoustic system.
A typical AIR Glide installation consists of at least one display unit and one AIR Glide Sensor Unit (ISU). The sensor collects and processes sensor data, the display unit displays the current flight situation derived from sensor data in an easy to understand fashion and accepts user input.

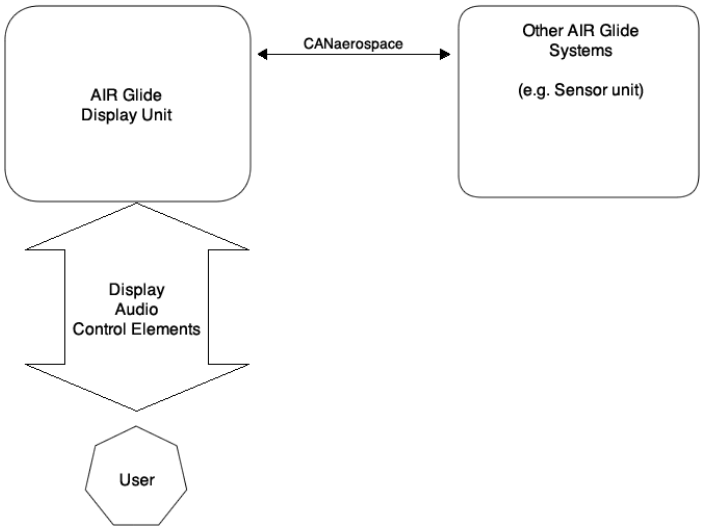


Figure 1: System Diagram

1.2 Design Goals

AIR Glide is designed for use in gliders as an aid to better and more efficient flying. AIR Glide is small, robust and can be mounted inside glider cockpits with relative ease.
AIR Glide Display S is intended to assist the pilot fly the glider efficiently and safely. The design employs state of the art technology, with an interface that is simple to use. The on-board audio processing system generates high quality sound, the integrated display delivers superior readability with nearly no reflections.

In many gliding accidents, pilot overload is known to be a contributing factor. Cross-country flying, competitions, busy airspace and flying in unfamiliar terrain can all cause a high pilot workload for long durations. A design goal of AIR Glide is to help relieve this situation by giving advisory messages and alarms when the aircraft is not being flown safely or efficiently.

2 Safety, Liability and Support

2.1 Safety instructions and restrictions on use

Installation and operation must be on the basis of non-interference with and no hazard to the existing suite of other equipment necessary for safe flying operation, or installed to comply with official requirements. Installation and operation must comply with official regulations and requirements.

The pilot is ultimately responsible for all flight decisions and for operating the aircraft safely at all times. For situational awareness only!

Never make safety critical decisions based displayed information.

AIR Glide Display S does not have a ETSO or FAA-TSO airworthiness certification. Make sure that it is legal to install it in your aircraft.

Do not use AIR Glide Display S if pilot-workload is increased by failure of AIR Glide or attached subsystems.

2.2 Intellectual Property and Liability

Butterfly Avionics GmbH, will not be liable for errors/changes/omissions in this document - specifications are subject to change without notice. Butterfly Avionics its associates, development team, suppliers, manufacturers and data suppliers accept no responsibility for any damage or claims that may arise from use of AIR Glide.

Trademarks referred to in this document are the property of their respective holders. Any decompiling, disassembly, reverse engineering, or modification of the instrument or firmware are strictly prohibited without specific written permission from Butterfly Avionics GmbH.

2.3 Support

2.3.1 World

To get support, please contact your local authorized AIR Avionics dealer.

2.3.2 Europe

Please contact us via eMail or Phone. Find more information on www.air-avionics.com or +49 (0) 6224 82 83 87 0

3 Operation And Controls

3.1 User Interface Elements

AIR Glide Display S is controlled through the controls on the display unit. The display unit contains two rotary knobs with pushbutton function and two additional pushbuttons.

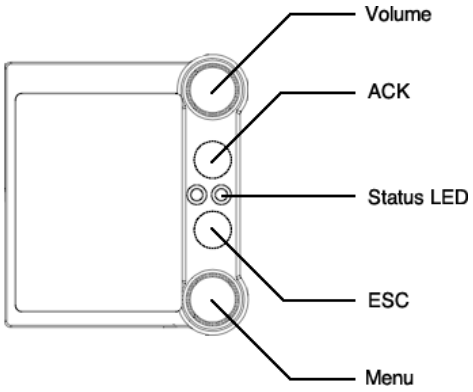


Figure 2: User Interface Elements on AIR Glide Display S

3.1.1 Rotary Knobs And Pushuttons

• The upper rotary knob (also ”Volume-Rotary-Knob”) is mainly intended for controlling audio volume and switching the unit on/off.
• The ACK-Pushbutton (speak ”Acknowledge”) is used to acknowledge a voice-message
• The ESC-Pushbutton (speak ”Escape”) is used to escape a menu level and to go one level higher / close the menu.
• The lower rotary knob (also ”Menu-Rotary-Knob”) is used to enter and control the main-menu and to switch between different display-pages.

3.1.2 Status-LED

The status LED indicates the current system status.

LED does not shine:	Unit in normal operation or switched off
LED shines amber:	Unit running, display not active

3.2 Switching AIR Glide ON and OFF

AIR Glide is switched on and off using the upper rotary knob.

3.2.1 Switching AIR Glide ON

Push longer than two seconds to switch the unit on. The status-LED shines amber indicating the boot process has been initiated.
After some seconds the boot-screen with boot information will appear.

Figure 3: Bootscreen

3.2.2 Switching AIR Glide OFF

To switch AIR Glide OFF, push the upper rotary knob longer than 2 seconds. A small menu appears allowing to switch the unit off. Use the upper rotary knob to switch the unit off or to cancel.

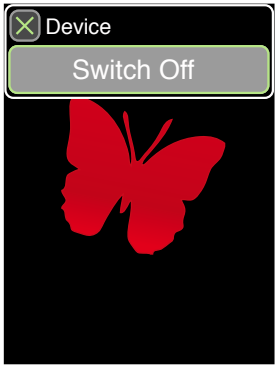


Figure 4: Small menu for switching the unit off

In case of a software failure, push longer than 5 seconds to switch the unit off (hard)

3.3 Display Pages

AIR Glide Display S contains five different display pages to display available data to the user. Navigating between these five pages is possible by rotating the lower rotary knob.

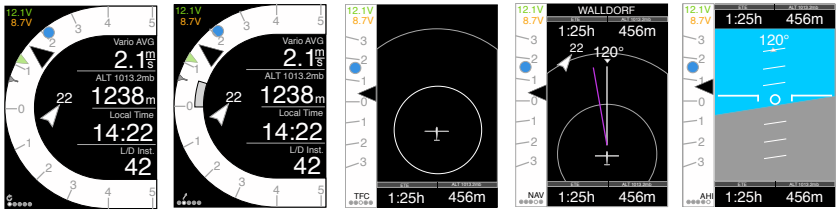


Figure 5: Five Display Pages, Vario, Speedcommand, Traffic, Navigation and AHI

3.3.1 Page Navigation Indicator

On every display page there is a small indicator in the lower left corner that indicates the current display page. With this indicator the user knows instantly which display page currently is active.

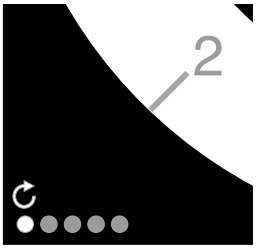


Figure 6: Page Navigation Indicator

> ***Switching a display page, e.g. from Vario-page to Speedcommand-page does not change the current flight-mode (Climb- or Cruise-mode). Flight-modes are either changed automatically (depending on circling or flying straight) or with an installed mode-switch (e.g. on the stick or flaps), see installation manual.***

3.4 Flight-Mode

AIR Glide has two different flight-modes, Climb and Cruise. Flight-modes can be either changed automatically (depending on circling or flying straight) or with an installed mode-switch on the stick or on the flaps. Sound-scheme and display are different depending on current flight-mode.

3.4.1 Sound-Scheme

Depending on current flight-mode, different sound-schemes are used. You can find details on sound schemes below in this manual.

Cruise Mode	Climb Mode
Speedcommand audio scheme	Vario audio scheme

3.4.2 Behavior when changing flight-mode

The following table shows system behavior when changing flight mode depending on the active display page.
Depending on your currently active display page, sound scheme and display page are changed.

Display Page	Switching to cruise mode	Switching to climb mode
1: Vario	Changing sound scheme to speedcommand, changing display page to speedcommand	Changing sound scheme to vario
2: Speedcommand	Changing sound scheme to speedcommand	Changing sound scheme to vario, changing display page to vario
3: Traffic	Changing sound scheme to speedcommand	Changing sound scheme to vario
4: Navigation	Changing sound scheme to speedcommand	Changing sound scheme to vario
5: AHI	Changing sound scheme to speedcommand	Changing sound scheme to vario

3.5 Menu-System

All menus work the same way and follow a hierarchic structure.

Figure 7: Main Menu

3.5.1 Entering the Menu and Menu-Levels

To enter main menu, push the lower rotary knob. The lower rotary knob has a printed *MENU* sign. To select a menu item, rotate the lower rotary knob. To execute a menu-item, push on the lower rotary knob. To exit one menu level or to exit the menu, push the ESC-button.

User Interface Element	Action
Push lower rotary knob	Open menu, execute menu-item
Rotate lower rotary knob (within the menu)	select menu item
Push ESC-Button	escape one menu-level, close menu

3.5.2 Types Of Menu Items

There are two different types of menu items, menu-items that lead to a deeper menu-level and menu items that execute functions. In the main menu for example *Direct To* directly opens the DirectTo function whereas *Setup* goes one menu-level deeper into the setup menu.

(a) Item without sub-menus **(b)** Item with sub-menus

Figure 8: Different types of menu-items

3.5.3 Directly closing the Menu

On the upper hand side of the menu, a small Button with an ”X” is always present. Executing this menu item instantly closes the menu and the current menu-level is saved. When opening the menu, the same menu level appears again.

Figure 9: Button to directly close the menu

3.6 Text-Input

In some menus, e.g. DirectTo or when entering information, it is required to enter text.

Textinput is performed with the lower rotary knob:

- Starting Textinput: - Select a textfield with the lower rotary knob, the first digit of a word now is selected.
- Choose a character: - Rotate the lower rotary knob until the desired character appears.
- Select the next letter: - Push and simultaneously turn the lower rotary knob to the right to select the next letter within a word.
- Delete a letter: - To delete a letter in a word, push and simultaneously turn the lower rotary knob to the left.
- Finishing textinput: -Push on the lower rotary knob.

(a) First letter of a word **(b)** Input on third letter

Figure 10: Textinput

4 Main Functions

4.1 Variometer

The Variometer is the main function of AIR Glide Display S. Vario indicators are prominently displayed on every one of the five display pages.

4.1.1 Variometer-Display-Page

The Variometer-Display-Page contains four info-boxes that can display desired values (user configurable), the vario-indicators, a wind-indicator and system parameters.

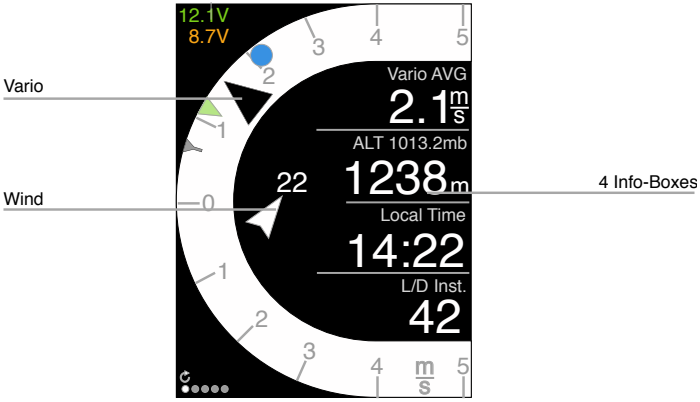


Figure 11: Variometer-Display-Page

4.1.2 Vario Indicator And Pointers

The vario indicator scale is a white area that is either round (on variometer- and speedcommand-display-pages) or linear (on all other display pages). It contains four different pointers that indicate basic variometer values.
Pointers differ in size, shape and color and thus are easily distinguishable by the user. The main variometer pointer is large and black.

Zeiger	Funktion
Big, black pointer	Vario-Value
Small green-grey pointer	Average Vario
Blue Circle	Vertical Air Mass
Little gray pointer (reverse) with tip	MacCready-Value

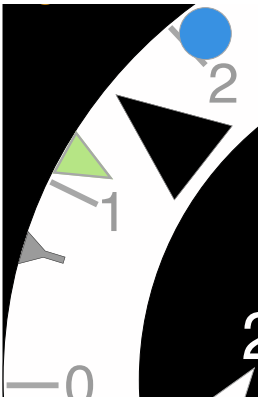


Figure 12: Vario Pointers

4.1.3 Vario indication On Other Display-Pages

Every other display-page contains a vario indicator as well.

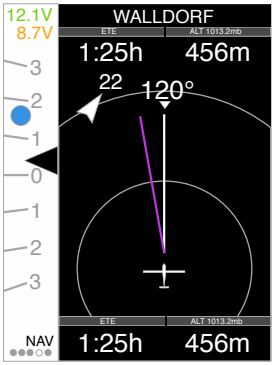


Figure 13: Vario-indicator on the left-hand side of the navigation display-page

4.2 Speedcommand

4.2.1 Speedcommand-display-page

The speedcommand-display-page features the same layout like the variometer-display-page. it also contains four info-boxes, that can be individually configured. Additonally a grey bar indicates if the current speed is too slow or too fast.

> *The separation of vario- and speedcommand display-pages allows for individual info-boxes to be set up for each flight mode.*

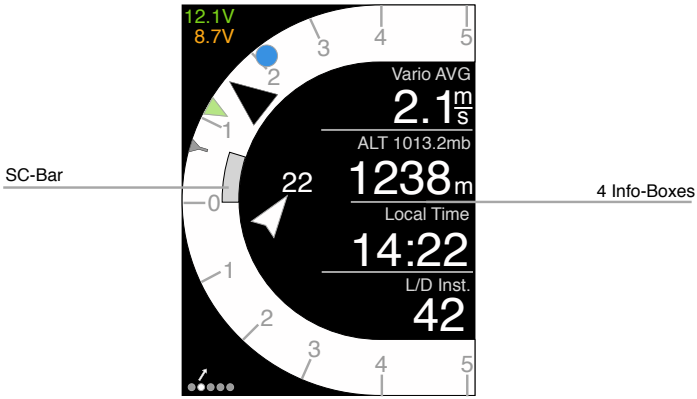


Figure 14: speedcommand display-page

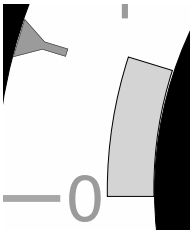


Figure 15: Speedcommand-bar, pointing upwards means ”fly slower”.

4.2.2 Speedcommand Behavior

Many factors play a role in the calculation of the current speed-to-fly in speedcommand-mode. The most crucial factor that can be adjusted by the user is the MAC-CREADY value.

> *To enter/change a MAC-CREADY value faster than entering the menu, push and simultaneously turn the lower rotary knob.*

More flight parameters relevant to speedcommand calculations can be set up in *Menu*, *Flight*. Speedcommand behavior like filters and input values can be set up in the menu under *Setup*, *Compensation*. More information in the chapter *Setup* of this manual.

More about speedcommand calculations and influence of different settings can be found in the chapter *Calculations And Informations* of this manual.

4.3 Traffic

4.3.1 Traffic-Display-Page

The traffic-display-page (TFC = Traffic) shows traffic data from connected collision-warning-units (CWU). It also contains two user-configurable info-boxes.

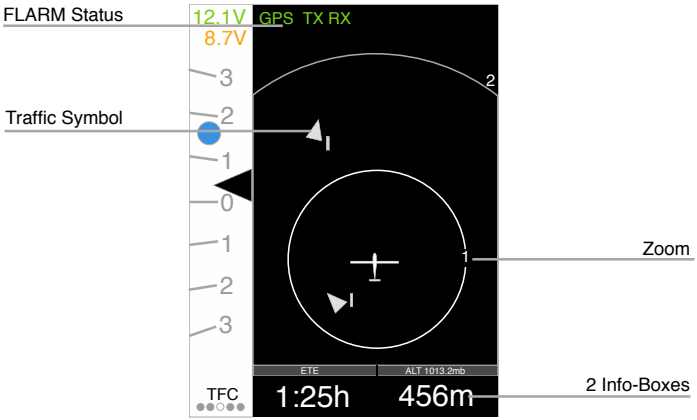


Figure 16: Traffic-display-page

Received traffic is depicted as arrows together with a bar indicating current relative altitude (bar facing upwards = traffic is higher). Arrows represent the current heading of displayed traffic (arrow pointing downward, opposite heading of traffic).

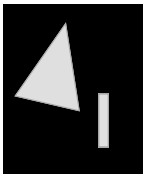


Figure 17: Traffic with similar heading, lower

If you do not use a collision warning unit, go to Menu, Setup, device, peripherals *and set* FLARM *to* N/A. *Wrong settings may delay the boot process of the whole system up to more than 100 seconds.*

To adjust the current display range of the traffic screen (zoom), you can push and simultaneously turn the lower rotary knob.

4.3.2 Status of connected collision warning units

The system-status of connected collision warning units is depicted in the upper part of the traffic page. Status information for GPS, sending (TX) and receiving (RX) FLARM-data is given. Additionaly in case of a singificant collision warning unit failure, a voice message indicating a failure is issued (if set.

Figure 18: Status of the collision warning unit, red indicates a failure

4.4 Navigation

The navigation-display-page (NAV) allows for navigation to saved points in the navigation database. Navigation targets are selectable in flight. Own navigation datasets can be imported into the navigation database.

4.4.1 Navigation-display-page

The Navigation-Display-Page contains four info-boxes that can display desired values (user configurable), a navigation display, a wind-indicator and a true heading indicator.

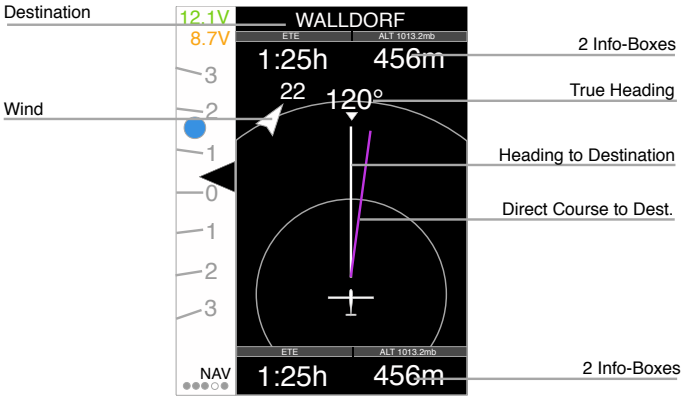


Figure 19: Navigation-display-page

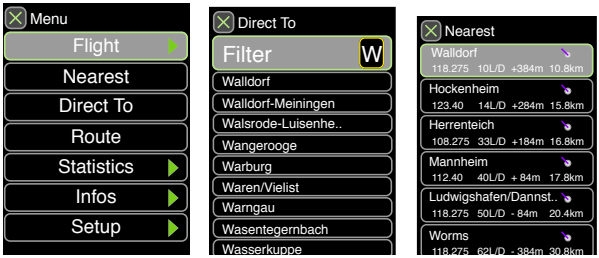
Displayed course lines represent:
- Current heading to target (White Line)
- Direct bearing to target (Magenta Line)

> *To adjust the current display range of the navigation screen (zoom), you can push and simultaneously turn the lower rotary knob.*

4.4.2 Target Selection In Navigation

The user has some options to select a navigation target.

The menu items *Direct To* and *NEAREST* allow for selection of a waypoint from the waypoint database (Direct To) or to select one of the nearest waypoints sorted by distance (Nearest).
Die Funktionen stehen im HauptMenu auf oberster Ebene zur Verfgung.



(a) Main menu **(b)** Direct To **(c)** Nearest

Figure 20: Menu and Direct-To, Nearest pages

4.4.3 Nearest Function

In the main menu under *Nearest*, the closest waypoints are shown sorted by distance. You can use the lower rotary knob to select a waypoint, push the button of the lower rotary knob to activate the waypoint.

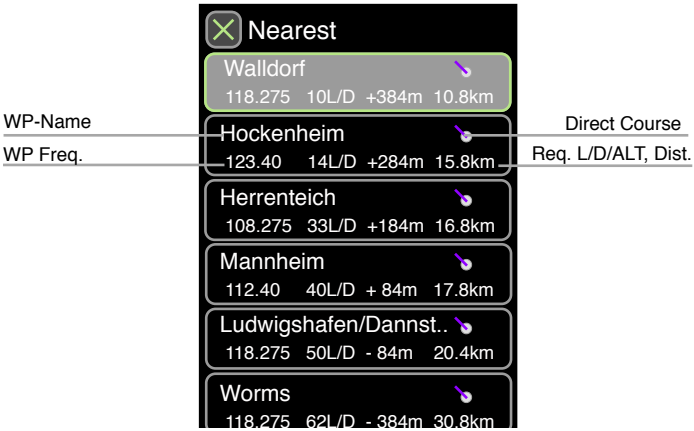


Figure 21: Nearest menu

Neben den waypointsn selbst werden Zusatzinformationen wie erforderliche Altitude, erforderliche Gleitzahl, Distanz und direkter Kurs zum Wegpunkt dargestellt.

4.4.4 Direct-To Function

In the main menu under *Direct-To*, all waypoints are shown sorted alphabetically. You can use the lower rotary knob to select a waypoint, push the button of the lower rotary knob to activate the waypoint.

It is possible to enter a waypoint name (or the first letters) via text input. More on text input can be found in the section *Oparation and Controls* of this manual.

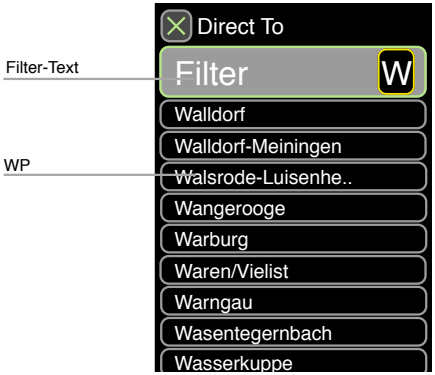


Figure 22: DirectTo menu

4.5 Attitude and Heading Indicator

The AHI-display-page shows an Attitude and Heading Indicator.

The AHI-Display-Page contains four info-boxes that can display desired values (user configurable), an artificial horizon and a true heading indicator.

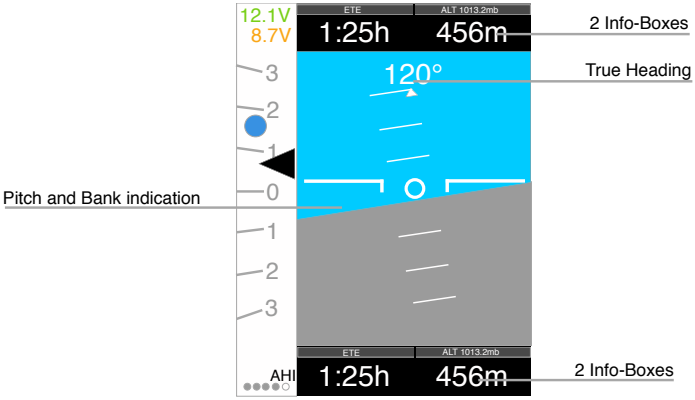


Figure 23: AHI-display-page

This function is not allowed in some competitions. Display of attitude information can be locked in competitions, please refer to the AHI-Lock*-section of this manual for details.*

Displayed data is not certified. Never rely on AIR Glide while flying in clouds. Never intentionally enter clouds while flying with AIR Glide!

No cloud flying is permitted except if permitted by law with current training a license for cloud-flying and certified equipment.

4.6 Flight Logging

The AIR Glide Sensor Unit (ISU) contains an integrated IGC approved flight recorder. The flight recorder records files in IGC format. The flight recorder is names ”Altair Recorder Unit V3” and integrated into the Sensor Unit (ISU). The Flight recorder is configured vie AIR Glide Displays like the Display S.

> ***Never try to open the enclosure of AIR Glide Sensor Unit (ISU). Any attempt to open the enclosure or loosen enclosre screws result void the integrated seals past recovery. Recorded flights loose validity.***

> *Interruptions of recording of more than 5 minutes (e.g. in case of power loss) result in the recording of two flights with two separate IGC-Files.*

4.6.1 Entering and declaring IGC Flight-Info and Tasks

Tasks as well as IGC-Flight-Info, i.e. information about the aircraft, pilot etc. can be entered in the menu. Go to *menu*, *flight* to enter data.

- Entering a Route:
  - Go to *Menu*, *Route*
  - Enter a desired route-name into ”Name”.
  - Go to ”waypoints” and set up desired waypoints.
- Setting up a route with waypoints:
  - Go to ”waypoints”
  - Choose a desired waypoint (e.g. ”Start”) or insert a waypoint with ”Add”
  - Click on the waypoint you wish to change, a Coordinate-Entry/waypoint-selection menu appears.
  - Enter desired coordinates or select a waypoint from the waypoint database (similar to Direct-To).
  - Use the ESC-button to return to the waypoints list.
- Entering a route from a file:
  - Synchronize a CUP-File that contains a route in the USB-Stick waypoints folder (see chapter ”Data Synchronization” in this manual for details).
  - Go to *Menu*, *Route*
  -The route from the file will be available.
- Entering a Route from an other device:[1]
  - Declare a route to AIR Glide. AIR Glide acts as ”Cambridge 302” in third party software. Make sure to use a datarate of 38400Bd.)
  - Go to *Menu*, *Route*.

[1] Butterfly NMEA Interface Unit required

The declared route from the device will be available.

4.6.2 Entering IGC Flight-Info

- - Go to *Menu*, *Route*, *IGC*.
- Enter your Data.
- Declare to a desired Flight Recorder (e.g. AIR Glide Sensor Unit (ISU)/RU).

4.6.3 Declaring a Route/Flight-info

- - Go to *Menu*, *Route*, *Declare*.
- Select a desired flight recorder, e.g. ”ISU/RU”

ISU/RU describes the flight recorder that is integrated in the AIR Glide Sensor Unit (ISU). AIR Glide is also capable of declaring to other flight recorders, e.g a connected FLARM IGC

4.6.4 Downloading Flights

Downloading is only possible after at least 5 minutes the device operates after landing.

Recorded flights can be downloaded with a USB stick. When booting AIR Glide Display S with an inserted USB-stick a menu appears that allows for downloading all flights that are not present on the USB-Stick. All Flights are put into the folder ”Flights” on the USB-Stick.

- Preparation:
  - Insert a USB-Stick into one of the USB-Ports of the display-unit (with or without extension).
  - Boot the device (if already running restart.
- Downloading Flights:
  - During the boot process, a message indicating ”new flights found” appears.
  - Click on ”Download” with the upper rotary knob to download flights.
  - Wait until download is finished. This may take up to some minutes depending on number and length of flights not on the USB-Stick.

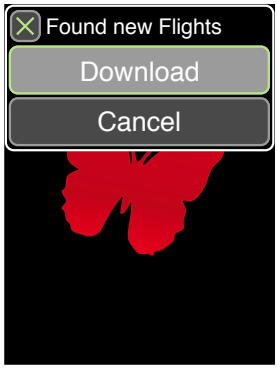


Figure 24: Downloading Flights

With the use of special software, downloading IGC-files is possible via RS232 directly on the AIR Glide Sensor Unit (ISU).

4.6.5 Flight Recorder Setup

The Flight-Recorder log-interval may be set up in *Menu*, *Setup*, *Flightrec*.

4.6.6 IGC-Pilot-Event

To trigger an IGC Pilot Event (PEV) in flight, open the Audio-Menu by clicking the upper rotary knob and click on the button *RU EVENT*.

Figure 25: Pilot-Event-Button in Audio-Menu

4.7 Features that are not allowed in some competitions

AIR Glide contains features (AHI Features) that allow for flying without ground reference. Depending on regulation it may not be allowed to use equipment that enables flying without ground reference in gliding competitions.
AIR Glide contains a special mechanism, that allows for tamper-proof locking of all such software features (AHI Features) that enable flying without ground reference. an AIR Glide unit with locked AHI Features can not be used for flying without ground reference.

4.7.1 Possibly Unallowed Features

Features allowing flying without ground reference:

- Attitude Indicator (Artificial Horizon page)
- True Heading Indicator (Navigation page or numerical value in info boxes)

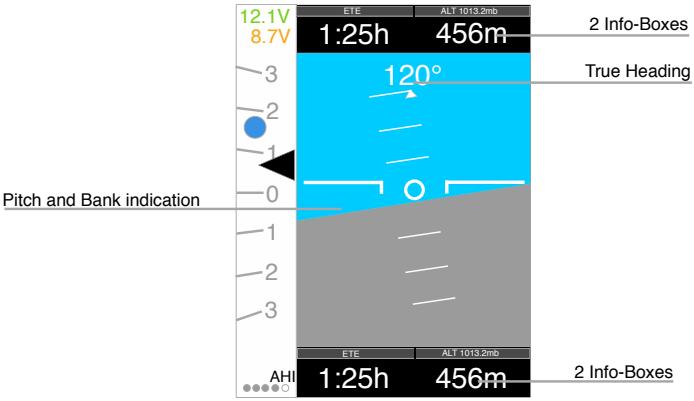


Figure 26: Artificial horizon Page (not locked)

4.8 Locking Unallowed Features / AHI Lock

4.8.1 Required Firmware Versions

The AHI Feature locking mechanism requires AIR Glide Firmware 1.06 or later. In version 1.07 lockout security is further improved. From Version 1.07 on no GPS time is required for the lock to be active.

It is recommended to always use the latest software release.

Using earlier software does not compromise lockout security.

Software updates and downgrathe do not affect the locking mechanism.

4.8.2 Security

The lockout mechanism is applied to all units in an AIR Glide installation. AHI Locking can not be circumvent by interchanging single components of an AIR Glide installation.

The lockout mechanism amongst others is stored in the secure part of the AIR Glide Sensor Unit (ISU) which is a secure fully IGC certified flight recorder with tamper proof enclosure and tamper proof encrypted software.

4.8.3 Locking the AHI

In order to use the AHI Lockout function, go to *Menu* then *Setup* then *Flightrecorder* and here to *AHRS Lock*. Click on *Lock* to activate the lock. To deactivate the lock, click on *Unlock*

4.8.4 Activating an AHI locking timeframe

In order to use the AHI Lockout function for a certain timeframe without the posibility to unlock, go to *Menu* then *Setup* then *Flightrecorder* and here to *AHRS Lock*. Here you can set a locking timeframe. Locking can only be enabled for a timeframe following the current time.

> *GPS time is required. Without GPS time AIR Glide is unable to determine exact timing and therefore the locking mechanism can not be set up. The process of obtaining GPS time may take up to 12 minutes. Without GPS time neither the locking mechanism nor the AHRS (AHI) itself will work properly.*

> *From software version 1.07, the lock is also active before obtaining valid GPS time.*

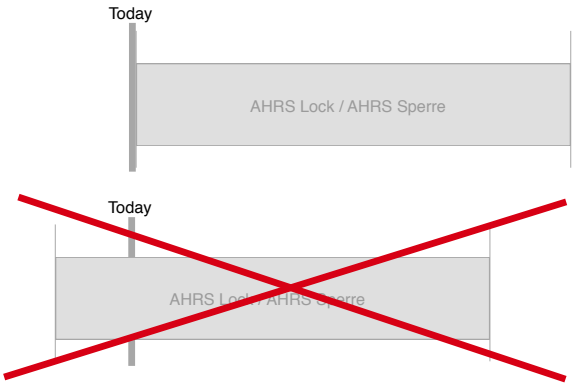


Figure 27: Possible timeframes for AHI locks

> ***BE VERY CAREFUL: It is not possible to unlock a locked system***

4.8.5 Behavior when AHI lock is active

When AHI lock is active, all features allowing flying without ground reference are locked and can not be displayed. For displayed heading data, a 5Hz GPS signal is used.

4.8.6 Determining if lock is active

During the timeframe the AHI-lock is enabled the user or e.g. a competition staff can at any time review the set up locking interval and thus is able to judge if the AHI lock has been enabled for the correct time in a competition.

> *To review AHI lock status go to* Menu *then* Setup *then* Flightrecorder *and here to* AHRS Lock

When locked, on the AHI page an amber colored cross is shown instead of the artificial horizon indicator.

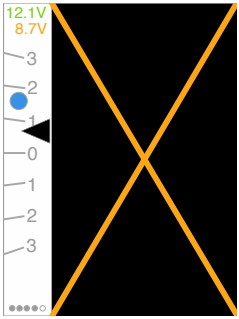


Figure 28: Artificial horizon Page (locked)

AHI lock status is additionally documented in the IGC Flightlogs of the AIR Glide IGC approved flight recorder. Even after the locking-interval users and competition staff can review the AHI locking status of flights through IGC files.

4.9 Hardware and Data Monitoring

4.9.1 Data Validity

All datasets are continuously monitored for validity. If a certain dataset does not pass data validity testing it is not displayed and an amber cross is shown instead.

Figure 29: Invalid dataset in an info-box

4.9.2 Powermanagement

AIR Glide continuously monitors input voltage on all power channels (it contains two). The current inpout voltage is shown in the upper left corner of any display-page.

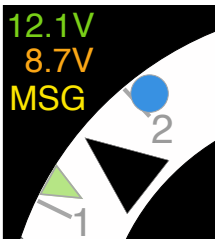


Figure 30: Input-voltage in the upper left corner of a display-page

Measured input voltages are color coded, undervoltage or overvoltage conditions are displayed in yellow (caution) or red (warning).

5 Audio-System

The Audiosystem consists of a voice-engine and a vario-audio generator.

> *AIR Glide does not deliver equal sound quality over the entire volume range. Starting at about 2/3 of the maximum volume, audio-output is overdriven to achieve more volume. From then on distortion factor increases and audio-quality decreases (maximum output 1.5W at 8 Ohm, distortion factor below 1 percent).*

5.1 Setting up volume

Three different audio volumes are configurable by the user:
- Vario-Volume
- Speedcommand Volume
- Voice Volume

The volume of the current tone (speedcommand/vario/voice) can always be set-up by rotating the upper rotary knob. E.g. if a vario-tone is present, you can set up vario volume by rotating the upper rotary knob.

(a) Current Volume **(b)** Audio Menu

Figure 31: Volume setup

5.2 Audio-Menu

With a click on the upper rotary knob you can enter the audio menu. In the audio menu you can set up all three volumes individually and also repear the last voice message (REP-Button). The Audio menu is navigated using the upper rotary knob. It automatically disappears when not used.

5.3 Bass Boost Feature

AIR Glide features a function that allows to increase volume of lower frequencies automatically. This ”Bass Boost” feature allows the use of small speakers that naturally have no good performance at low frequencies.

To set up you Bass Boost, go to *Menu*, *Setup* und *Device* and set*Bass-Boost* to a desired value. The standard setting for the supplied speaker is 3, the value can be set from 0 to 9.

5.4 Vario/speedcommand Audio

Vario and speedcommand audio schemes are provided to give aural feedback on current vehicle dynamics in all flight-mode. Pilot gets feedback without having to look inside the cockpit.

> ***Never disrespect aircraft restrictions in speed and acceleration, even if the speedcommand function tells you to do so.***

5.4.1 Sound-Scheme in Cruise-Mode

Status	sound-pitch	Beeps
Faster	decreases, when aircraft shall accelerate	Double-Beep of constant duration
Slower	Increases, when aircraft shall decelerate	short Double-Beep

It is possible to activate a climb-mode-sound-scheme even if in cruise-mode under certain conditions. Go to *Menu*, *Setup* and *Device* and set *SC vario-sounds* to a desired condition. The following table describes possible settings.

Status	sound-pitch	Beeps
Speed-to-fly slower than speed of minimum sink	Increases when climbing more	short beep, faster when climbing more
Vario-Value better than half of the current MC-Value	Increases when climbing more	short beep, faster when climbing more

> *If SC-Vario-Sounds are inactive, a positive relative netto value leads to additional modulation indicating a thermals lift before starting to circle / switch modes*

5.4.2 Sound-Scheme in Climb-Mode

Status	sound-pitch	Beeps
Climbing	Increases when climbing more	short Beep, faster when climbing more
Sinking	decreases when sinking more	constant tone

5.5 Voice Output

AIR Glide creates voice messages for traffic- or obstacle-warnings, warnings regarding configuration (gear/flap warnings), warnings when flying outside the safe flight envelope and also status messages regarding connected devices (e.g. FLARM) or system messages (GPS, battery etc.).

The voice-system is interactive, the user is able to acknowledge voice-messages and to repeat them if desired. All voice messages can be deactivated and are configurable in *Menu*, *Setup*, *Voice*.

5.5.1 Message Priorities

Four different message priorities are used to filter and schedule voice messages.

Format	Sound	Importance
Message	no	Informal
Note	Ping	low
Caution	BeepBeep	Important
Warning	Siren	urgent!

5.5.2 Messages

The following messages are currently implemented.

> *In Traffic-messages relative altitude is expressed as* below, lower, higher, above*. Distance is indicated in 100m steps, e.g. an object with 500m distance has the number* five*.*

Message	Reason	Format	Example
Infomessage traffic	traffic information	Ping, direction,altitude, traffic-type, distance	”PING 12 O’Clock above Glider 5”
cautionmessage traffic	dangerous traffic	BeepBeep, direction,altitude, traffic-type, distance	”BeepBeep 12 O’Clock above Glider 5”
Warnmessage traffic	Very dangerous traffic	Siren, direction,altitude, traffic-type, distance	”Siren 12 O’Clock above Glider 5”
cautionmessage obstacle	obstacle collision hazard	BeepBeep, Obstacle, Distance	”Siren, Obstacle, five”
Warnmessage obstacle	major obstacle collision hazard	Siren,Obstacle, Distanz	”Siren, Obstacle, five”
Warnmessage VNE	Exceeding VNE	Siren,Speed	”BeepBeep Speed”
Infomessage VA	Faster than VA	BeepBeep,Speed	”BeepBeep Speed”
message airbrakes	airbrakes not locked during takeoff	BeepBeep,Airbrakes	”BeepBeep Airbrakes”

message gear	airbrakes not locked, gear retracted	BeepBeep,Gear	”BeepBeep Gear”

5.5.3 Acknowledging Messages

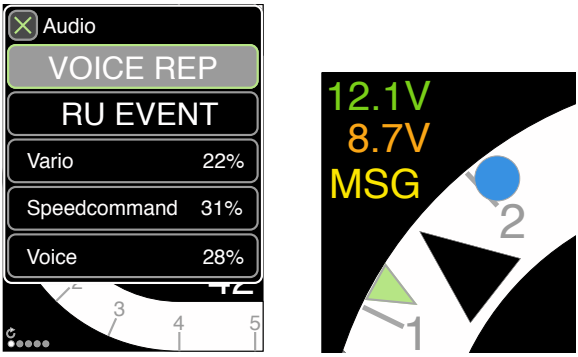
Messages may be acknowledged by clicking on the ACK-Buttton. Acknowledged messages are not repeated for a certain timeframe. The timeframe depends on message priority.

• message priority increases: Acknowledged messages are repeated with updated information on values like e.g. distance. • message priority decreases: Acknowledges messages are not repeated.

5.5.4 Repeating Messages

Acknowledged messages can be repeated in the audio menu (click on upper rotary knob). Values of repeated messages (like distance e.g.) are always kept up-to-date. To repeat a message click on VOICE REP in the audio-menu or doubleclick on the upper rotary knob.

> *Whenever a message is imminent and can be repeated through the use of VOICE REP, a small MSG indicator appears.*



(a) VOICE REP Button **(b)** MSG Display

Figure 32: VOICE REP and MSG Features

6 Setup

6.1 Setup of Flight-Paramters in Flight.

The following parameters can be set up by the user in flight. To change these parameters, go to *Menu*, *Flight*.

Parameter	Function
Mac-Cready Value	Expected climbrate in next thermal
Ballast	Ballast-Weight
Bugs-Factor	Polar-degration because of bug contamination, in percent of performance loss
QNH	Current QNH-Value (Nautical height reference for barometric altimeter)
Pilot weight	pilot weight (gross including parachute and equipment)

6.2 Filter- and Compensation-Values

6.2.1 Filters and Recommended Values

AIR Glide has many filters and averager functions. Values like variometer value, air-mass, speed-command can be filtered taking individual

Parameter	Beschreibung	Empfehlung
TEK-Filter	time-constant to filter the Variometer Value (speed of big, black pointer)	2.8 seconds
VAM Filter	time-constant to filter the air-mass value (Ansprechgeschwindigkeit blauer Ball)	3.4 seconds
Wind Filter	time-constant to filter the wind value	5.0 seconds
TEK AVG Filter	Time for Vario Averager	20 seconds
SC ERR Filter	time-constant fr speedcommand (speed of speed-command indications)	1.0 seconds
VAM-MIX	Mixing input-values for vertical air-mass (VAM) in percent AHRS (0: Netto Vario only, 100: AHRS only)	30 to 50 Prozent

All filter settings can be set up in Menu, Setup, Compensation.

In the menu-item *aircraft* it is possible to select aircraft specific performance data like polars. The following data is available:

Parameter	Description
Polar	Coefficient based aircraft polar
Reference weight	Weight for reference wing load
Ref. wing-load	Standard wing load

payload	maximum payload
Empty weight	empty weight
Ballast	maximum ballast
VNE	Never exceed speed
VA	Maximum speed in rough air

For changes to take effect restarting the unit is required.

You can also import own aircraft-performance data. See the chapter data-synchronization *of this manual for details.*

6.3 Magnetometer-Compensation

Depending on installation quality and general aircraft specific factors there may be magnetic interference disturbing the systems sensors. In order to minimize disturbance at a certain installation position, magnetometer sensors inside the AIR Glide Sensor Unit (ISU).

The magnetometer compensation is performed in-flight through flying of ”eights”.

In-Flight magnetometer compensation may only be performed by personal that is familiar with the aircraft. It must be performed in safe altitudes and if required under guidance by ATC. Calibration does not require the pilot to look inside the aircraft, always maintain a good lookout

The calibration process may be aborted at any time. Do not proceed with calibration if unsure of your current flight-situation, altitude or surrounding traffic.

6.3.1 Performing Magnetometer Compensation

• Go to *Menu*, *Setup* and *ISU* and click on *Magneto Comp.*
• Fly ”eights” with varying bank angle. Best results are achieved when flying the eight in north-south direction. Do not switch your devices off, that normally are active in-flight.
• After having collected sufficient data, the compensation process automatically stops. You can manually stop compensation by clicking in *Magneto Comp. Stop*.
• After compensation the Sensor Unit (ISU) is rebooted. In a time of 1 to 5 minutes this can lead to display of non-plausible values.

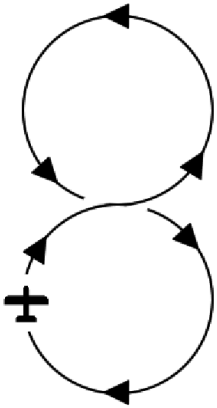


Figure 33: ”Eight” for magnetometer compensation

6.3.2 Quality indicator

In the lower area of the magnetometer compensation menu a status indicator shows the current compensation status during compensation process. An indicator ranging from 0 to 9 shows how many datasets have been collected so far.
If the quality indicator does not exceed at least quality 6, no compensation parameters are stored.

> *If the system is unable to collect sufficient data (quality below 6), compensation will not stop automatically. In this case magnetic interference is the most probable reason.*

> *In some areas of the world quality indicator may not exceed values of four or 5, in this case manual stop of the compensation process is required.*

6.4 Individualization and Adaption

6.4.1 Language

The menu structure currently is available in two languages, German and English..

User interface language can be set up in the *Menu* under *Setup*, *Device*.

> ***Changing user interface language only takes effect after restarting the device.***

6.4.2 Units

Units for specific values can be set up in *Menu*, *Setup*, *Units*.

6.4.3 Info-Boxes

In *Menu* under *Setup*, *Device* and *Infobox* it is possible to set up info-boxes on all display-pages individually. All available values are shown in the table below.

Name	Beschreibung
accel.gload	G-load
acft.ld.inst	Current L/D
airmass.rho	air density
airmass.temperature	Temperature
airmass.vh	airmass horizontal (Wind)
airmass.vv	airmass vertical
airmass.vv.avg	airmass vertikal average
airmass.windvector	wind average
alt.FL	Altitude FL
alt.qfe	Altitude QFE
alt.qnh	Altitude QNH
alt.std	Altitude standard
gps.altitude	GPS Altitude MSL
gps.speed	GPS Speed ground
gps.track	GPS Course ground
lift.avg	average climb
lift.gain	Altitude gain
lift.load.avg	average climb last thermal
lift.load.gain	Altitudengewinn last thermal
speed.ias	IAS
speed.mcdyn	MC-Speed dynamic
speed.mcdyn.err	MC-Speed dynamic error
speed.mcstat	MC-Speed dynamic static
speed.tas	Speed true air
time.UTC	Time UTC
time.enroute	Flighttime
time.local	Time local
vario.avg	Vario average
vario.gros	Vario
vario.net	Vario Netto
waypoint.ETE	ETE to Waypoint
waypoint.THC	not used
waypoint.altrequired	required altitude
waypoint.bearing	Bearing to waypoint
waypoint.dist	Distance to waypoint
waypoint.glideSlopeDist	Altitude above glidepath
waypoint.heading	Wheading to waypoint

6.4.4 Other settings

Many other settings can be found in *Menu*, *Setup*.

6.5 Factory Reset

A reset of individual settings to factory settings is possible.

• Reset general settings to factory settings (Flightrecorder and Magnetometer remain unchanged.)	Go to *Menu*, *Setup*, *Device* and *Factory Settings*
• Reset Flightrecorder settings to factory settings	Gehen Sie auf *Menu*, *Setup*, *Flightrecorder* and *Factory Settings*
• Reset Magnetometer Compensation to factory settings	Go to *Menu*, *Setup*, *ISU*, *Magneto Comp* and *Factory Settings*

7 Maintenance and First Use

7.1 First Use

7.1.1 Switching AIR Glide on the first time

Push the button in the upper rotary knob for 3 seconds until the status-LED begins to shine. After a short time the Butterfly Logo appears and boot-information is shown.

If you do not have a collision warning system connected, boot-up-time will be about 100 seconds longer. Go to Menu*,* Setup*,* Device*,* Peripherals *to change settings accordingly.*

Depending on installation, it is normal that the artificial horizon is not level before flight.

7.2 Required Settings

7.2.1 Before first flight

Before the first flight the following settings are mandatory.

- Select an aircraft type from the list in *Menu*, *Setup*, *Compensation*
- Adjust all time filters in the same menu.
- Set the audio volume to a desired value.
- Select system language according to your requirements (Details about language setup in the chapter *Setup* of this manual).
- Go to *Menu*, *Setup*, *Device*, *Peripherals* and set all your connected peripherals. Set all not connected items to *N/A* and all others to appropriate values.

without a proper setup in the peripherals settings, some function will not work .

7.2.2 Special settings when installing multiple displays

- Make sure all peripheral settings are setup correctly in each display unit corresponding to connected peripherals
- Go to *Menu*, *Setup*, *Device* and set the *CANas Node ID* of the secondary unit to the value *"2"*.

without a proper setup a two-seater installation will not work .

7.2.3 During first flight

- Inspect heading and wind values. If you experience inaccuracies in heading or no wind display, perform a magnetometer compensation according to the chapter *Magnetometer-Compensation* of this manual

Depending on installation, in some cases a magnetometer compensation is not required.

7.3 Softwareupdates

Firmware of all AIR Glide subsystems can be easily updated by the user using a USB-Stick.

7.3.1 Prepare an Update

Make sure your USB-Stick is FAT-Formatted.

AIR Gli name is

- Download current firmware here: www.air-avionics.com
- Put your file into a folder called ”firmware” an a USB-stick. USB-Sticks synced with AIR Glide already have this folder created.

7.3.2 Updating your Device

- Preparation:
  - Insert a USB-Stick (containing firmware-file) into one of the USB-Ports of the display-unit (or over extension)
  - Switch your device on
- Update:
  - Cancel synchronization and flight-download-messages if they appear by clicking on the ESC-Button
  - An ”Update-Menu” appears, start the update by clicking on ”update” with the upper rotary knob.
  - Wait until the unit has rebooted

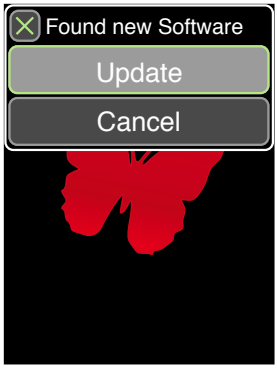


Figure 34: Update-Menu during boot process

Make sure that AIR Glide always has power during the update process. Switching the unit off during update may cause damage beyond easy repair.

7.4 Data Synchronization

Many different datasets can be synced between AIR Glide and a USB-Stick. All data between AIR Glide and the USB-Stick are kept in sync during synchronization.

7.4.1 Behavior

- During the first synchronization (with an empty USB-Stick) the normal folder structure is created.

- Datasets that are not present on the USB-Stick (or delted from the stick by the user) are also deleted from AIR Glide

7.4.2 File- and Datatypes

The follwoing file-/datatypes are transferred:

Dateityp	Funktion
.CUP	waypoints and task-data
.AIP	waypoints
.XML	Glider performance data (polar etc.)

System parameters and diagnostic data are transferred as well.

7.4.3 Synchronization

- Preparation:
  - Insert a USB-Stick (containing firmware-file) into one of the USB-Ports of the display-unit (or over extension)
  - Switch your device on

- Synchronization:
  - A message called ”Synchonize” appears during startup
  - Click on ”Synchronize” with the upper rotary knob.
  - Wait until Synchronization is complete.

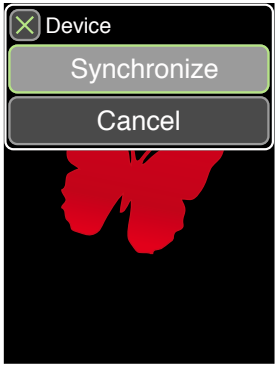


Figure 35: Synchronization menu during boot-process

7.4.4 Navigation data

Butterfly has free to use worldwide Airport-Data available on the Butterfly website: www.air-avionics.com

7.4.5 Downloading recorded flights

Flights can be downloaded during startup. The chapter *Flight Recording* of this manual conains more details.

8 Calculations and Informations

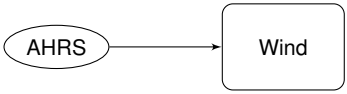
8.1 AHRS

AHRS or *Attitude Heading Reference System*[2] is an inertial sensor platform and a combined processing unit. Sensors for acceleration, turn-rate, compass and pressure as well as GPS and temperature sensors are integrated in the AIR Glide Sensor Unit (ISU), part of an AIR Glide installation.

The AHRS system delivers precise information to air-flow vectors like wind and vertical air-mass.

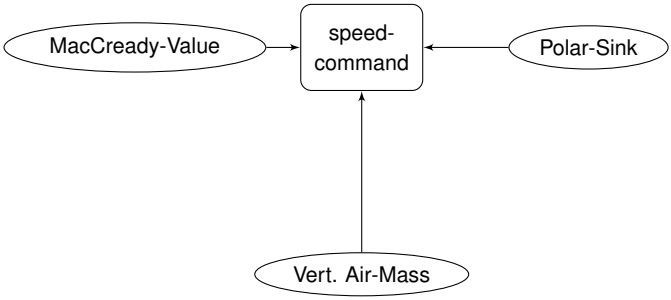
8.2 Wind Calculation

AIR Glide computes wind using the AHRS system:



Wind is calculated about 20 times per second.

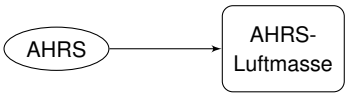
8.3 Speedcommand



8.4 Vertical Air-Mass

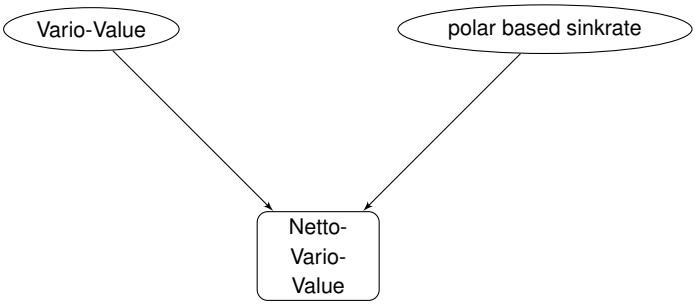
The vertical air-mass (VAM) value is thecribed with the blue-ball in the vario-indicator. VAM is computed from two input values, *AHRS-air-mass* and *netto-vario-value*.

The *AHRS-air-mass* is directly derived from AIR Glide's AHRS system and thus not prone to indication errors that result from horizontal air-mass-movement (gusts).

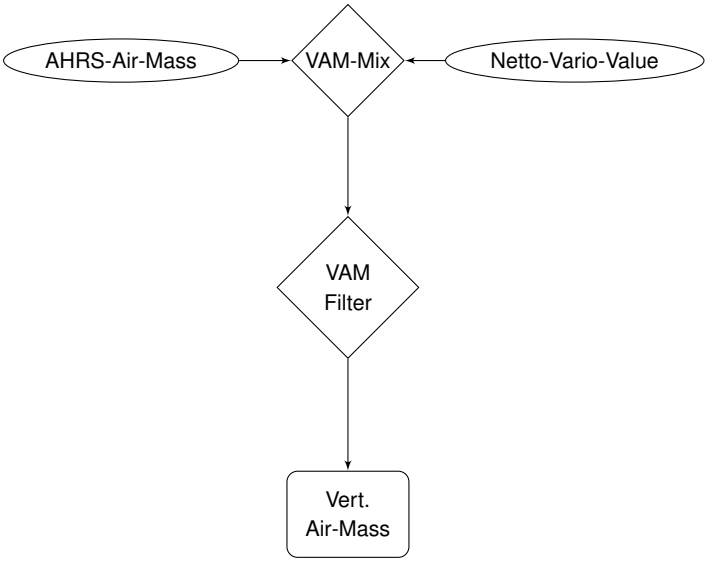


[2] http://en.wikipedia.org/wiki/AHRS

Netto-Vario-Value is computed from the Vario-value and the current sinkrate at current speed described by the aircrafts polar:

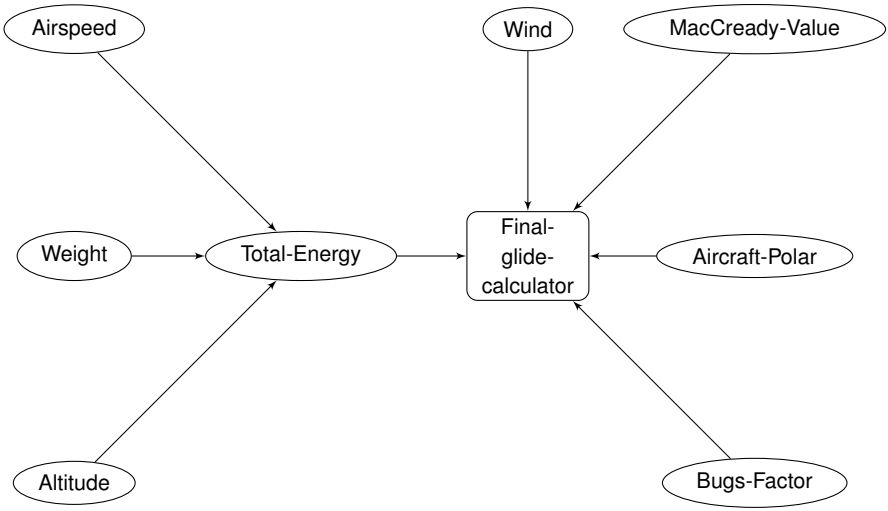


The two input values *AHRS-air-mass* and *netto-vario-value* are combined in the *Vertical Air-Mass-Value (VAM)*



The VAM-Filter slows calculated vertical-air-mass values with a defined time-constant. The VAM-mixer mixes the two input values *AHRS-air-mass* and *netto-vario-value*. Both values may be set up in *Menu*, *Setup*, *Kompensation*. More about this in the section *Setup* of this manual.

8.5 Final Glide Calculation



Final-glide calculation does not take any safety altitude into account!

Appendix I: Import of own Aircraft performance data

Behavior

After import of an own glider-file, the normal aircraft database is replaced by the imported file. After deleting the file from your *Polars*-Folder on the USB-stick and re-syncing, the normal aircraft database is available again.

The imported file must be named glider.xml

Glider File

A file containing aircraft performance data is an XML file with specific datasets

Importing own glider files is only recommended for experts. Importing wrong files may render AIR Glide unusable!

Example

```
<BUTTERFLY VERSION="1" DATAFORMAT="1.0">
  <GLIDERS>
    <GLIDER>
      <!--name the flugzeuges muss eindeutig sein-->
      <!--ggf muss spezielles feld fr anzuzeigende namen eingefgt werden-->
      <NAME>ASG-29e</NAME>
      <!--die geschwindigkeitspolare minthetens ein knoten-->
      <POLAR>
        <!--drei polarenpunkte-->
        <!--alternativ knnen auch die polinom koeffizienten
              angegeben werden <A>a_2</A> <B>a_1</B> <C>a_0</C>-->
        <POINT>
          <!--horizontal geschwindigkeit EAS-->
          <V UNIT="KM/H">80</V>
          <!--vertikal geschwindigkeit EAS-->
          <W>-0.521</W>
        </POINT>
        <POINT>
          <V UNIT="KM/H">120</V>
          <W>-0.721</W>
        </POINT>
        <POINT>
          <V UNIT="KM/H">200</V>
          <W>-2.52</W>
        </POINT>
        <!--minimumgeschwindigkeit normalisiert bei gegebender flŁchenbelastung-->
```

```
        <VMIN UNIT="KM/H">78.0</VMIN>
        <!--gegebene flŁchenbelastung-->
        <REFWINGLOAD>38.0</REFWINGLOAD>
      </POLAR>
      <!--leermass (ohne pilot loose equipment und ballast-->
      <EMPTYMASS>333</EMPTYMASS>
      <!--maximale zuladung der nichttragenden teile (im rumpf)-->
      <MAXPAYLOADMASS>110</MAXPAYLOADMASS>
      <!--maximale zuladung ballast-->
      <MAXBALLASTMASS>200</MAXBALLASTMASS>
      <!--maximale zulŁssige abflugmasse-->
      <MAXTAKEOFFMASS>600</MAXTAKEOFFMASS>
      <!--flgelflŁche in kg/m^2-->
      <WINGAREA>10.8</WINGAREA>
      <!--VNE-->
      <VNE UNIT="KM/H">270</VNE>
      <!--V manver-->
      <VA UNIT="KM/H">210</VA>
      <!--V max mit gesetzten wlbklappen (> 0)-->
      <VFLAPS UNIT="KM/H" />270</VFLAPS>
    </GLIDER>
  </GLIDERS>
</BUTTERFLY>
```

Notes